

At, by, to, and past: An Essay in Multimodal Image Theory

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At, by, to and past: An essay in multimodal image theory

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1. **The Data.** It is well known that prepositions are highly polysemous words, displaying a wide range of motivated but apparently unpredictable meanings. The prepositions at, by, to and past provide a good example.

In some contexts, the prepositions at and to are roughly synonymous:

- (1)a. They looked at the house.
- b. They looked to the house.

There is a similar rough synonymy between by and past:

- (2)a. They looked by the house.
- b. They looked past the house.

In these contexts, the prepositions at, to, by and past denote directions. At and to denote directions oriented toward contact with the landmark; by and past denote directions oriented toward--but to one side--of the landmark.

Despite these rough similarities, there are major differences in usage:

(i) to and past collocate readily with verbs of movement. In this context, to denotes reaching a location, whereas past denotes continuing further:

- (3)a. They ran to the house.
- b. They ran past the house.

In the same context, by remains synonymous with past but at takes on rather different connotations:

- (4)a. They ran at the house.
- b. They ran by the house.

That is, (3a) entails that they reached the house; (4a), merely that they approached it.

(ii) At and by collocate readily with verbs of static position. In this context, at denotes spatial coincidence and implies the presence of functional interaction; by denotes spatial proximity and implies a lack of functional interaction:

- (5)a. They are at the house.
- b. They are by the house.

- (6)a. They are at the gate.
- b. They are by the gate.

Notice that at can denote either coincidence with a region apprehended as a point or proximity (Cuyckens 1984). In the same context, to is ungrammatical, whereas past takes on an endpoint-focus interpretation in which it denotes location at the end of a path which goes by the landmark:

- (7)a. *They are to the gate.
- b. They are past the gate.

Note the contrast between by and past: (6b) denotes location to the side of the gate; (7b), location beyond the gate.

(iii) At and by have senses in which they collocate with measure nouns and denote clearance from the landmark. In this context, at denotes how far TR is in front of LM, and by denotes how far TR is to the side of LM:

- (8)a. I missed at a hundred yards.
- b. I missed by a hundred yards.

The prepositions past and to have no such senses:

- (9)a. *I missed to a hundred yards.
- b. *I missed past a hundred yards.

(iv) The applicability of at and by seems to depend upon the presence of an orienting surface, typically but not necessarily the surface of the Earth. To and past are compatible with any orientation. To illustrate the point, consider the following situations:

- (10) The speaker holds a penny in midair and places a finger in front of the penny.
- (11) The speaker tapes a penny to a wall and then places a finger in front of the penny.

In situation (10), one cannot felicitously assert My finger is at the penny. In situation (11) one can. Similarly, consider situations (12) and (13):

- (12) The speaker holds a loose doorknob in midair and places a hand underneath the doorknob.
- (13) A doorknob is in its normal position on a door. The speaker places a hand underneath the doorknob.

In situation (12), one cannot felicitously assert My hand is by the doorknob. In situation (13), one can.

These examples illustrate the fact the presence of a salient surface in the background can significantly alter the contexts in which at and by are appropriate. To and past are not context-sensitive in the same way. Thus sentences like (14) could be used of either (10) or (11), while (15) could be used of either (12) or (13):

- (14) a. I moved my finger to the penny.
b. I am moving my finger past the penny.
- (15) a. I put my hand to the doorknob.
b. I am waving my hand past the doorknob.

2. Accidental polysemy or semantic regularity? There are at least two analytical approaches that can be taken to the kind of data we have just examined. One hypothesis would postulate that the irregularities in the data reflected accidental polysemies. One could conclude, for example, that there are two prepositions at: a locative at which describes spatial coincidence and a adlative at which describes approach. One might conclude, equally, that at and by just happen to have 'distance' senses in sentences like (8), a sense which the prepositions by and past just happen to lack. On this view, the prepositions by and past in their directional uses come very close to true synonymy: it just happens that by but not past has developed a static locative sense, while past but not by has developed an endpoint focus sense. This view is quite common. It is the view adopted in Jackendoff (1991: 72), Sweetser (1986: 532), and Choi and Bowerman (1991: 112). Once it is assumed that a distributional pattern reflects accidental polysemies, the only issue that remains is whether there is a motivated relation among the meanings (polysemy) or if the relation is unmotivated (homonymy). Once this point has been decided the description stops.

On the other hand, if we assume that distributional irregularities reflect underlying semantic regularities, we have a much more difficult analytical task, but the explanatory potential is much greater. Consider, for example, the preposition at. In locative uses, at often carries an implication of functional interaction (Herskovits 1986: 135). If locative at is considered in isolation, the analysis essentially stops at that point. We may note that other proximity prepositions, such as by, do not carry the same implication, and thus conclude that the implication is lexically associated with the word, but we cannot explain why the word the lexical association exists. On the other hand, if we consider adlative uses of at, such as I charged at the enemy, we immediately note that at carries very similar

implications: orientation toward the landmark with intent to engage. We may then hypothesize that one basic element of *at*'s meaning is the idea 'oriented so as to interact with the landmark'. If our semantic theory allows us to predict when this element will be present and when it can be suppressed, we will end up with a much more useful account. Even if it is difficult to account for apparent irregularities, the hypothesis of semantic regularity deserves to be pushed as far as possible, for regularities not looked for are certain not to be found.

The author has been developing an approach to the semantics of spatial prepositions which instantiates the hypothesis of semantic regularity (cf. Deane 1993a, b). This approach, which may be termed *MULTIMODAL IMAGE THEORY*, is inspired in part by recent findings in the neuropsychology of spatial cognition (cf. Paillard, ed., 1991). This framework may be briefly described as follows: To begin with, a distinction is made between three types of spatial image, each of which constitutes a separate modality of spatial thought:

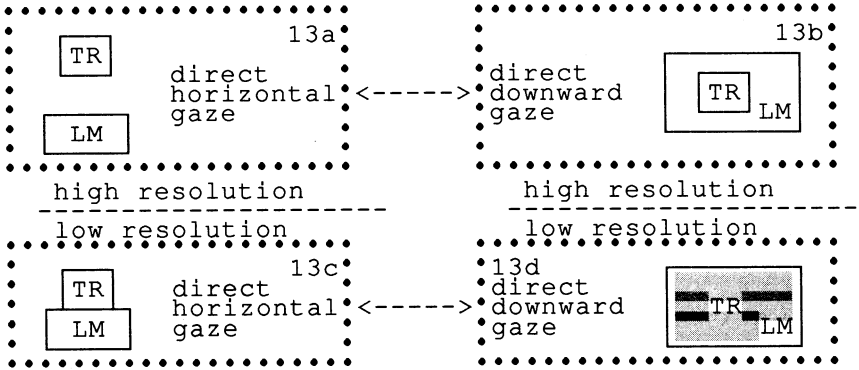
(i) *VISUAL SPACE* images, which represent spatial relationships in terms of such variables as occlusion, visual separation, angle of gaze, etc. The obvious function of visual space images is to interpret visual information in spatial terms. Visual space images presuppose a visual frame of reference in which position is calculated relative to the line of gaze.

(ii) *MANEUVER SPACE* images, which encode the kind of information needed for fine motor control, such as the clearance between objects or the effects of moving or rotating one object when it is close to another. Maneuver space images presuppose an object-centered frame of reference in which position is calculated relative to the surface of a reference object.

(iii) *KINETIC SPACE* images, which encode the kind of information necessary to calculate force-dynamic interaction (cf. Talmy 1985), such as conceptual *PATHS* which define direction (and potential) for movement, degree of impetus, and resistance to impact. Kinetic space images presuppose a dynamic frame of reference in which the up-down dimension is defined by gravity and the forward-back dimension by the orientation and (potential) movement of a reference entity, often the speaker or a viewpoint character.

The second characteristic of the framework is that it defines spatial relations as clusters of images in which each image defines some view or aspect of the whole. For example, Deane (1993a, b) defines *over* in part by the following cluster of visual space images:

(17)

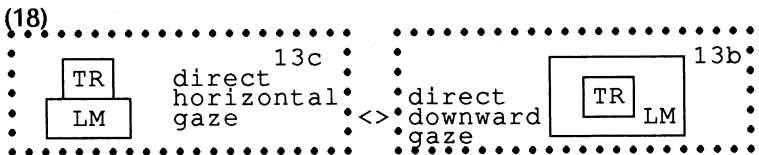


(17) characterizes prototypical over by defining what it looks like under varying perceptual conditions. (13a) provides a side view: at this angle, we observe that TR is higher than LM and separated from it by a gap. (13b) provides a top view: at this angle we observe that TR partially blocks off our view of LM. (13c) provides a blurred side view, such as we might obtain at a distance. Under these conditions, TR appears to touch LM: indicating that they are relatively close, as a larger gap would remain visible even in a blurred image. Finally, (13d) provides a blurred top view, in which TR appears to cover LM.

The third characteristic of the framework is that it provides principles by which to predict polysemy and lexical irregularity, at least with regard to a preposition's spatial meanings. There are two major principles:

(i) Semantic variants of a preposition are derived from its prototype by combining images from its prototype. In other words, the images which define a preposition are assumed not only to define its meaning but to provide a kind of prototype by functioning as PREFERENCE RULES in the sense of Jackendoff (1983, 1991).

(ii) Irregularities and gaps are assumed to reflect either an underlying difference in meaning or the blocking effects of paradigmatic opposition. That is, a preposition's semantic variants must be distinct from the prototype for any competing competition. For example, (18) is not a permissible variant of (17) because it will form (part of) the prototype for on:

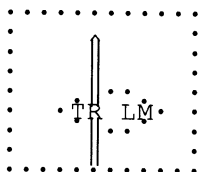


In what follows, prototypes will be proposed for the prepositions past, by, to, and at. In each case, the word's polysemy and basic distribution can be deduced from the prototype.

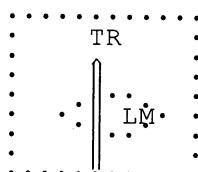
3. Past vs. By. Within the theory under consideration, the preposition past has a very simple semantic representation. Consider (19):

- (19) TYPE OF IMAGE: Kinetic Space
 PREPOSITION DEFINED: past
 ARGUMENT STRUCTURE: TR=external argument;
 LM=object of past

a.



b.



The images in (19) contain four elements: a moving object, TR; a reference object, LM; the path along which TR is being tracked, and an interaction zone around LM which defines the region within which TR is capable of interacting dynamically with LM. (19a) is the key image: it describes a relation in which TR is passing along a path which traverses LM's interaction zone and emerges on the other side. (19b) represents the anticipated final state of (19a) in which TR has reached the end of the path. In the present theory, the concept PATH is only defined in kinetic space images; endpoint focus, or tracking a path to its endpoint, is an automatic process. There are thus two possible combinations: (19a) plus (19b), in which past indicates the direction of movement or orientation, and (19b), in which it defines location at the end of a path. Notice that these images predict the word's syntactic distribution more or less automatically. The sequence (19a) plus (19b) can only be interpreted as an indication of movement or direction; it is thus compatible only with verbs like point or move which indicate the appropriate dynamic patterns. On the other hand, a static verb like stay or stand is compatible with (19b) but not with the dynamic sequence (19a) plus (19b). The theory thus predicts that past will take on an endpoint focus sense with static verbs like stay or stand.

Contrast the preposition by. It is a rather more complex preposition than past, a fact which is reflected in the complexity of the proposed definition:

Notice how (20) accounts for the polysemy and distribution of by as a preposition of spatial proximity:

(i) The preposition is not associated with a PATH image in kinetic space; it is thus incapable of developing an endpoint focus sense.

(ii) If we select one of the maneuver space images, we define a static relationship in which TR is close enough to LM to require us to calculate the clearance between them. This yields the basic proximity sense of by which collocates with verbs of static location.

(iii) The combination of images (1a) and (1b) jointly define a DIRECTION OF DISPLACEMENT in which TR's current position is its closest approach to LM. This yields the directional sense of by which collocates with verbs of motion and orientation.

(iv) Images (1a) and (1b) prominently feature the clearance between TR and LM. If we background the actual landmark and profile the clearance instead, we can account for the use of by to indicate degree of clearance as in (8b).

(v) Maneuver space images are always oriented to a local frame of reference defined by the surface of the ground object. This accounts for the fact that walls and other flat surfaces can alter the applicability of by: they provide an alternate frame of reference.

4. To vs. At. Examination reveals that to contrasts with at much as by contrasts with past. We may set up the following set of contrasts:

<u>Defined in Kinetic Space</u> <small>ONLY</small>	<u>Defined in Maneuver Space</u> <u>and Kinetic Space</u>
<u>Poised to Approach</u> <u>LM</u>	TO AT

<u>Poised to Bypass</u> <u>LM</u>	PAST BY

However, a crucial asymmetry breaks the parallelism between at and by. The preposition by always denotes static position; it can never be used to describe location AFTER bypassing LM:

- (21)a. I am standing by the gate.
 b. I am now by the gate. (This does not mean 'I have now bypassed the gate')

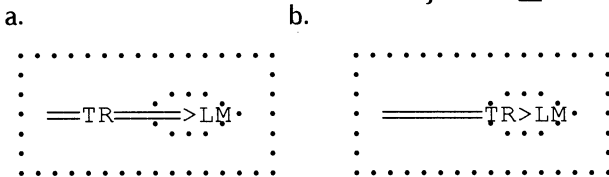
The preposition at, by contrast, can be used to describe either (a) static location or (b) location after approaching. That is, one can say either (22a), which is essentially static, or (22b), which implies previous movement:

- (22)a. I am standing at the gate.
 b. I am now at the gate.
 (This does mean 'I have now approached the gate')

These results imply that at must be associated not with one kinetic space image, as was proposed for by, but with two. One image indicates static location, the other location after movement.

The following prototypes may therefore be proposed:

- (23) Type of IMAGE: Kinetic Space
 WORD DEFINED: to
 ARGUMENT STRUCTURE: TR=external argument;
 LM=object of to



Note that the preposition to does not have an endpoint focus sense. This is a direct consequence of the fact that at and to share the endpoint focus image. Since the image is shared, the principles of the theory predict that it cannot be isolated as a semantic variant. Since the preposition to is only associated with two images, the net effect is to bar to from developing an endpoint focus sense. It can only be used to indicate motion or orientation along a path.

On the other hand, the preposition at is associated with a rather wide variety of images. It therefore displays a wide range of meanings. Since image 2a is shared with the preposition to, this image cannot be isolated as a separate sense. The result: at is not directly interpretable in an endpoint-focus sense. Image 2a can only appear if combined with some other image. For example, if combined with image 2b or the maneuver-space images in (1), it yields sentences like (24):

- (24) The enemy are now at the door.

(24) describes the enemies' position as resulting from movement toward the door, but it adds other nuances: the nuance of image 2b, most likely, implying that the enemy are ready to use the door, but possibly implying that there is some clearance between enemy and door (image 1a).

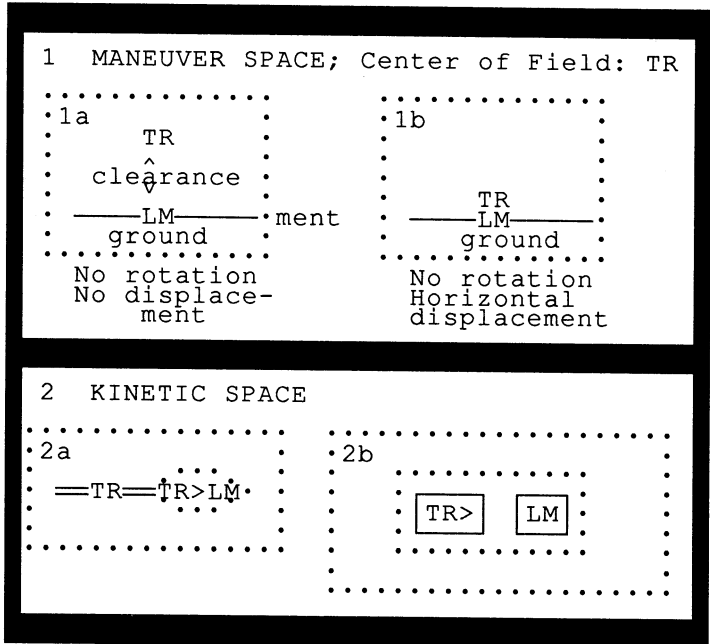
Pure maneuver-space interpretations are also possible. For example, when at combines with a verb of static location, we obtain sentences like (25):

- (25)a. Jane is camping at the castle.
 b. John is camping at the bottom of the cliff.

(25a) is a typical use of at with concrete nouns. The maneuver-space ground is the surface of the earth; the castle is construed as a location on the ground. Jane is located not in contact with the castle but where movement is likely to bring her into contact with it. In other words, Jane must be either in or by the castle. (25b) is a slightly different use, what Herskovits (1986: 136-137)

(26) WORD DEFINED: at

ARGUMENT STRUCTURE: TR_1 or 2 = external argument
 LM_1 or 2 = object of at



terms 'spatial entity at location in highlighted medium'. In (26b), the cliff is the ground, the bottom of the cliff is the landmark, and at indicates that John is close enough to the bottom of the cliff to anticipate possible contact. Another sense of at can be derived by isolating maneuver space image (1b), yielding the sense of at which occurs in (27): i.e., contact with a point on the ground.

(27) They are at the center of the circle.

The maneuver space images also yield appropriate results when combined with a verb of motion. The two images (1a) and (1b) imply a direction of movement: toward contact with the landmark. But they also imply that contact is not actually achieved at the trajector's current location. And this is exactly the sense at has in sentences like (28):

- (28)a. They ran at me.
b. They hit at me.

(28) implies that the trajector never actually reached its goal: at the end of the action, there was still clearance between the trajector and the landmark. This is exactly what (24) predicts.

Notice that at, like by, can take a NP denoting the clearance as its object. This accounts for sentences like:

- (29) He misses at 100 yards.

Finally, (24) accounts readily for uses of at to describe functional interaction. As Herskovits (1986: 135-136) notes, this is a frequent use of the word:

- (30)a. Jane is at her desk.
b. John is at the wheel.

This interpretation can be derived by isolating image 2b from (24).

The prototypes for at and by also account well for certain additional differences between them. It is difficult to use at with respect to a person, whereas by is normal:

- (31)a. John is by his brother.
b. ??John is at his brother.

This difference follows from the fact that at requires its LM to be a location on the ground; people are not normally construed as locations. By, by contrast, defines LM as a separate object at the same level as TR: a condition readily fulfilled when one person is placed next to another. Note that in (30a), by implies that John is not facing his brother. This follows because John must be positioned so that he is poised to bypass his brother.

The prototypes we have postulated also account for certain well-known contrasts between at and by:

- (32)a. Jane is at her desk.
b. Jane is by her desk.

At is appropriate only if Jane is expected to move toward contact with her desk, i.e., if she is likely to make use of it. By, on the other hand, implies that Jane is likely to move away from her desk, i.e., has an impetus directed away from the desk--an expectation incompatible with the expectation of imminent use.

15. Conclusion. The chief purpose of this paper has been to explore the idea that it is possible to explain and possibly even predict the polysemy and distribution of spatial prepositions. While the analysis presented here is of necessity exploratory, the results are encouraging. To sum up:

(i) There are two ways that a preposition may combine with a verb of motion or orientation. On the one hand, it may directly

denote a path in kinetic space. On the other, it may describe a direction-of-displacement in maneuver space. This is why there are such similarities between by and past, on the one hand, and at and to on the other. They define similar directions even if they do so in very different ways.

(ii) Past has an endpoint-focus sense because it describes location along a path in kinetic space. By has no endpoint-focus sense because it is defined primarily in maneuver space; its only kinetic-space image defines a static location. To would have an endpoint-focus sense, but it shares the relevant image with at. The shared image prevents to from having an endpoint-focus sense at all. At can provide a functional substitute, but only if additional nuances are added which keep at distinct from to, such as being poised to functionally interact with the landmark.

(iii) At and by can be used to describe clearance from the landmark because they define relations in maneuver space, where clearance is a salient spatial property. To and past lack clearance senses because they lack maneuver space images upon which such a sense would be based.

(iv) The applicability of at and by can be altered by the presence or absence of walls, ceilings, and other surfaces because they are oriented in maneuver space. Maneuver space images always require a local surface to define their horizontal and vertical dimensions. To and past are not context-sensitive in their orientation because they are defined in kinetic space without reference to extrinsic dimensions.

To the extent that such results can be replicated and extended for other prepositions, they suggest that prepositional polysemy is a predictable phenomenon. If this is correct, it is an important result. Polysemy has traditionally been the 'problem child' of lexical semantics, a phenomenon generally swept under the rug because it resisted available techniques. Recent approaches to polysemy, such as Brugman (1981), Brugman and Lakoff (1988), Lindner (1981) or Norvig & Lakoff (1988), have often achieved descriptive adequacy by distinguishing a large set of meanings and listing them exhaustively. If polysemy can be predicted, linguistic semantics may face entirely new prospects for explanatory adequacy.

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